

SETI OBSERVATIONS ALONG THE GALACTIC PLANE

Interim Report

JPL Task 1019

Robert A. Preston, Tracking Systems and Applications Section (335)

Sam Gulkis, Planetary and Life Detection Section (322)

Steven Levin, Astrophysics Element (3262)

Jill Tarter, SETI Institute

Jack Welch, UC Berkeley

A. OBJECTIVES

For the first time both NASA's Vision ("...to find life beyond") and NASA's Mission ("...to search for life") highlight the importance of astrobiology with the agency. The Astrobiology Roadmap makes it clear that the search for life extends beyond the microbial world to life with advanced technology. Moreover, Congress has recently expressed support for a revival of government funding for the search for extraterrestrial intelligence (SETI), in part due to the interest in astrobiology by the general public and the great success of extrasolar planet searches during the past few years.

The purpose of this DRDF task is to generate a detailed plan showing how NASA might initiate a SETI program, a critical missing component in NASA's strong astrobiology program, paving the way for long-term, dedicated surveys of the galactic plane for SETI and astronomical purposes.

JPL was a major participant in a previous NASA SETI program, which was terminated in 1993 for political reasons. This earlier SETI program incorporated both an all-sky survey on the DSN (Deep Space Network) 34-meter network and a targeted search of 1000 nearby stars on other radio telescopes. The targeted search has been continued with philanthropic support. However the all-sky survey required use of DSN telescopes and could not be continued without NASA support. This was unfortunate, since a search for SETI signals over the entire sky requires the minimum number of assumptions about the most likely source of intelligent signals.

About 90% of the stars in the Milky Way Galaxy are concentrated within the galactic plane that occupies approximately 10% of the sky, making it an ideal part of the sky to start a SETI sky search. A galactic plane SETI survey might be achievable with the DSN network over the next few years, with much of the observing done at DSS13, the DSN's research-and-development 34-meter antenna, on which significant observing time is available. Such a galactic plane survey will require new wideband receivers, and a high-resolution, wideband spectrometer. Fortunately, this and other advanced instrumentation for SETI searches are being built for the Allen Telescope Array (ATA), a new, dedicated SETI array for targeted searches and traditional radio astronomy, being constructed with private funding. We are collaborating with the SETI Institute and the UC Berkeley Radio Astronomy Lab, the partners in the ATA, to develop a plan to transfer these technological advances to DSS13. This equipment would then be used for the

proposed galactic plane SETI survey, perhaps expanding later to a full sky survey. A side benefit is the introduction of new state-of-the-art equipment to the DSN that might be useful for spacecraft tracking through this close collaboration with the outside SETI/radio-astronomy community.

This DRDF task is acting as seed funding to develop a strong plan for the galactic plane SETI search in collaboration with the SETI Institute and UC Berkeley. This work involves constructing a strong rationale for the survey, deciding which hardware and software are needed, and formulating an operational plan. In this process we are drawing significantly on the heritage at JPL of the earlier NASA all-sky SETI survey as well as on ATA equipment and experience. We are constructing a detailed schedule and budget for the galactic plane survey, which could be funded by NASA and be achieved with minimal requirements on the DSN spacecraft-tracking network.

B. PROGRESS AND RESULTS

Good progress has been achieved toward the goal of having a comprehensive plan for a new SETI survey program carried out at the DSN, including estimated costs. In particular, we have:

1. Determined the science goals of the SETI search and the parameter space that will be searched.
2. Devised an observational scenario for the program.
3. Defined the data analysis strategy, including details and cost of the needed software and hardware.
4. Designed and costed the needed modifications to DSS-13.
5. Designed and costed the required spectrometer (which will push the state-of-the-art).
6. Developed and costed an operational and data-handling/analysis plan.

C. SIGNIFICANCE OF RESULTS

The resulting white paper will be used in discussions with NASA on the possibility of reinstituting a SETI survey from the DSN. In the interim, a pilot program of SETI observations will be initiated at DSS-13 in FY'04 through the JPL Research and Technology Development program. These pilot observations will test and demonstrate key technical and conceptual aspects of the full SETI galactic plane survey.

D. FINANCIAL STATUS

The total funding for this task was \$114,700, of which \$70,055 has been expended.

E. PERSONNEL

In addition to the investigators on the task, Paul Goodwin of JPL led a study team that designed and costed the needed modifications to DSS-13.